High Temperature, Low Sag Conductor

Contract #: 500-01-025 **Work Authorization #:** E2I-WA-002
Contractor: Electricity Innovation Institute
Project Amount: $100,000
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Status: Active

Project Description:
The purpose of this project is to evaluate the performance of selected "high-temperature, low-sag" conductors that are capable of significantly increasing the ampacity of thermally constrained transmission lines without the need for extensive tower redesign. Examples include 3M, Invar, and Gapped conductors, and commercial forms of aluminum steel-supported conductors (ACSS) such as ACSS-TW.

The majority of overhead transmission lines currently use steel-reinforced aluminum conductors (ACSRs). ACSRs can be routinely operated at temperatures up to 100 degrees Celsius (212˚ F) and, during emergencies, at temperatures as high as 150 degrees Celsius (302˚ F). Today, however, power industry deregulation is placing new demands on the delivery system and altering high-voltage transmission network power flow patterns. Consequently, networks are increasingly being forced to support power flows and transfer capacities for which they were never designed.

One approach to addressing this dilemma would involve upgrading the transfer capacity through reconductoring selected network lines. In recent years, conductor manufacturers have produced new, nontraditional conductors capable of operating at temperatures as high as 250 degrees Celsius (482˚F) without violating present electrical clearances to ground and other objects. While these conductors have passed most industry standard tests for performance, utilities are wary of installing these yet unproven technologies without having first gained an insight into their performance in a real-world setting.

The project will provide the participating utilities with information on the operational performance of these new conductors through approximately three years of field trial experience and laboratory tests that will be specified by the project funders. In addition, the project will evaluate the performance of conductor fittings -- including splices and dead-ends -- in both field and laboratory tests.

Further, the project will compile practical "engineering-type" information to aid utilities in designing, specifying, installing, inspecting, and maintaining the conductors. The results will position participating utilities as informed buyers and users of the technology.

Participants will have the benefit of gaining first-hand experience on the installation and operation of "high-temperature, low-sag" transmission conductors. Host utilities will have the "high-temperature, low-sag" transmission conductor installed in their transmission system, benefiting from learning directly about their capability.

This project contributes to the PIER program objective of:

- Improving the reliability/quality of California's electricity by enhancing the capabilities of the State's transmission and distribution system. These cables have the potential of increasing the current carrying capability of California's existing transmission corridors beyond their original design capabilities.

The objective of this project is to answer questions, such as:

- How do manufacturer claims compare to field and laboratory performance?
- What are the design parameters for these conductors?
- What engineering changes are necessary when replacing existing conductors with these products?
- What is the impact of these conductors on existing tower design?
- What special handling precautions apply?
- How do these conductors age, and what factors influence aging?
- What is the long-term performance of line hardware?
- How do conductor fittings perform under high temperatures over long periods?
- What are the costs of operation and lifetime costs?
- What inspection techniques should be used?
- What engineering guidelines and training materials are required?

Proposed Outcomes:

1. Evaluate the performance of selected "high-temperature, low-sag" conductors that are capable of significantly increasing the ampacity of thermally constrained transmission lines without the need for extensive tower redesign.
2. Provide the participating utilities with information on the operational performance of these new conductors through approximately three years of field trial experience and laboratory tests.
3. Evaluate the performance of conductor fittings -- including splices and dead-ends -- in both field and laboratory tests.
4. Provide a summary and analysis of the field and laboratory results. Present findings to funders at a final project workshop.

Project Status:

The project is behind schedule. Electrical Power Research Institute (EPRI) has had difficulty in finding companies willing to participate and meet the EPRI terms and conditions of the demonstrations. EPRI has updated a schedule of activities for this Tailored Collaborative taking into account the changing cable marketplace. It is expected that the project will be completed by 2008.